

Silent running electric motor by viscoelastic bearing supports

H.G. Tillema

Faculty of Engineering Technology
Twente Institute of Mechanics

P.O. Box 217, 7500 AE Enschede, The Netherlands
phone +31-(0)53-4892460, email hedzer.tillema@skf.com



University of Twente
The Netherlands



Introduction

A research project is started in cooperation with SKF on the development of a design method for viscoelastic bearing supports. Ultimate goal of the investigations is to reduce noise of rotating machinery, such as gearboxes and electric motors.

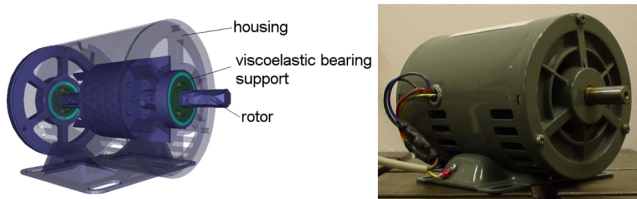


Figure 1 : Viscoelastic bearing support in an electric motor

As an example, an electric motor (see Figure 1) is analysed both numerically and experimentally.

Methods

Sound intensity measurements are performed to determine the acoustic behaviour of a running motor, which is placed on an acoustically hard table (Figure 2). Simultaneously, the structural response of the outer surface is measured, and is used for a hybrid calculation of the acoustic radiated power using a simple cylindrically shaped BEM model.

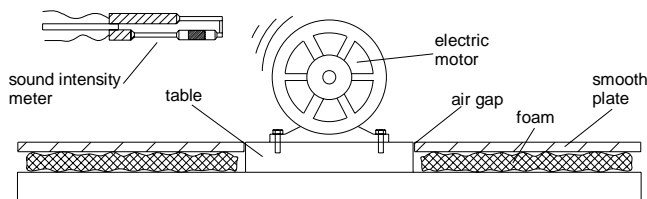


Figure 2 : Sound intensity measurements of an electric motor

Results

The radiated acoustic power of the electric motor is determined experimentally, hybridly and numerically (Figure 3).

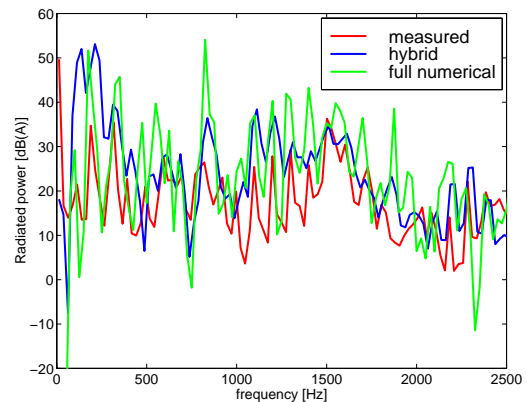


Figure 3 : Radiated acoustic power of the electric motor

A good agreement is obtained between experiment and hybrid calculation. Due to structural modelling inaccuracies, the full numerical prediction shows some deviations. However, it appears that a simple BEM model is capable of predicting the general acoustic behaviour of a complex vibrating structure.

A sound reduction, specifically in the high frequency range, is obtained with a viscoelastic bearing support as illustrated in Figure 4.

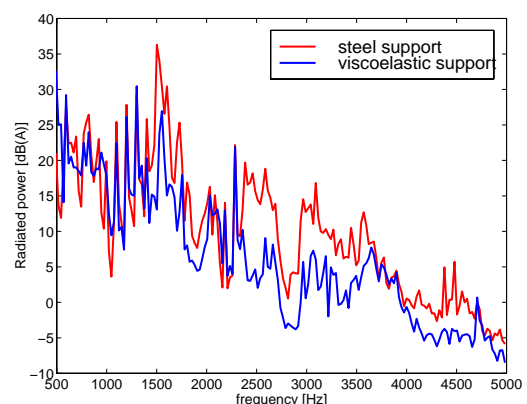


Figure 4 : Measured radiated sound power by the electric motor with steel and viscoelastic bearing supports

Conclusions and future research

A running electric motor has been silenced by the use of viscoelastic bearing supports. Using a numerical design approach the effectiveness can be improved.